Approval

Model No. :
Parts Code : V33A00025100

SAMSUNG
ELECTRONICS

Customer : TOSHIBA   **DATE : 27. Nov. 2008**

SAMSUNG TFT-LCD

MODEL : LTA460HA08

Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's Approval		APPROVAED BY	DATE
		Kyunghwan Ko	27. Nov. 2008
SIGNATURE	DATE	PREPARED BY	DATE
		Swangji . Lee	27. Nov. 2008

LCD Business

Samsung Electronics Co . , LTD.

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* Revision History

Date	Rev. No	Page	Summary
Nov , 27 2008	000	all	First issued

General Description

Description

LTA460HA08 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 46.0" is 1920 x 1080 and this model can display up to 16.7 million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV

Features

- RoHS compliance (Pb-free)
- High contrast ratio & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle (±178°)
- High speed response & Natural Motion
- FHD resolution (16:9)
- Low Power consumption
- Direct Type 16 CCFLs(Cold Cathode Fluorescent Lamp)
- DE(Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface (2pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	$1083(H_{TYP})$ x $627(V_{TYP})$	mm	±1.0mm
	$57.5 (D_{MAX})$		
Weight	13,500 (Max.)	g	
Pixel Pitch	0.530(H) x 0.530(W)	mm	
Active Display Area	1018.08(H) X 572.67(V)	mm	
Surface Treatment	Anti-Glare		
Display Colors	FRC 8bit – 16.7M	colors	
Number of Pixels	1920 x 1080	pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Luminance of White	500 (Typ.)	cd/m²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item	Symbol		Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}		GND-1	13.2	V	(1)
Storage temperature	T_{STG}		-20	60	℃	(2)
Operating temperature	T_{OPR}		0	50	℃	
Surface temperature	T_{SUR}		0	60	℃	(3)
Shock (non - operating)	S_{NOP}	X,Y	-	40	G	(4)
		Z	-	30		
Vibration (non - operating)	V_{nop}		-	1.5	G	(5)

Note (1) Ta= 25 $\pm$ 2 °C
  (2) Temperature and relative humidity range are shown in the figure below.
    a. 90 % RH Max. (Ta $\leq$ 39 °C)
    b. Relative Humidity is 90% or less. (Ta $>$ 39 °C)
    c. No condensation
  (3) Although abnormal visual problems can be occurred in T_{SUR} range,
    the polarizer is not damaged in this range.
  (4) 11ms, sine wave, one time for $\pm$X, $\pm$Y, $\pm$Z axis
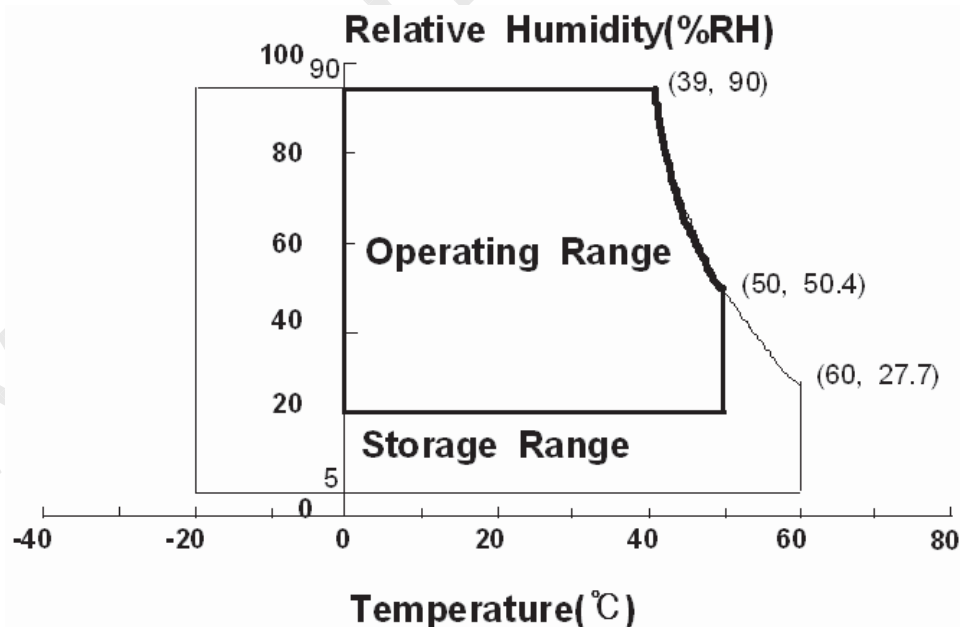 (5) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

Fig. Temperature and Relative humidity range

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2. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON BM-7,SPECTRORADIOMETER SR-3, ELDIM EZ-Contrast
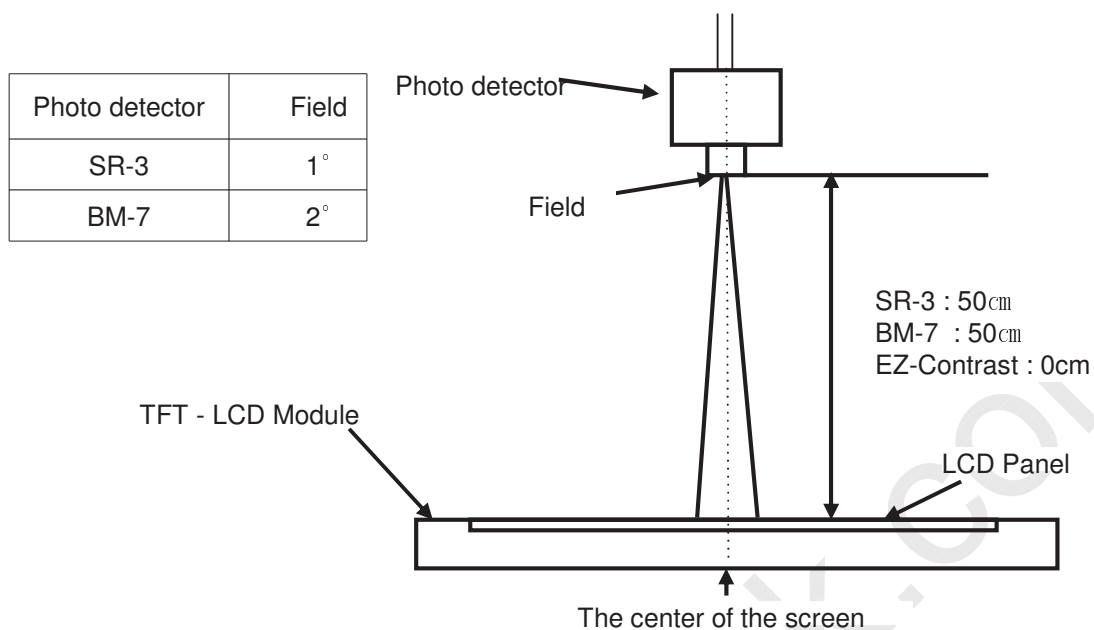(Ta = 25 ± 2°C, VDD=12V, fv= 60Hz, f_{DCLK} =74.25MHz)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal θL,R=0 θU,D=0 Viewing Angle	2,500	4,000	-		(3) SR-3
Response Time	Rising	Tr		-	15.0	20.0	msec	(3) RD-80S
	Falling	Tf		-	6.0	9.0		
	G-to-G	Tg		-	8.0	10.0		
Luminance of White (Center of screen)		Y_L		400	500	-	cd/m²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.630	TYP. +0.03		(5),(6) SR-3
		Ry			0.330			
	Green	Gx			0.285			
		Gy			0.605			
	Blue	Bx			0.150			
		By			0.060			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10000	-	K	(5) SR-3
Viewing Angle	Hor.	$θ_L$	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		$θ_R$		75	89	-		
	Ver.	$θ_U$		75	89	-		
		$θ_D$		75	89	-		
Brightness Uniformity of White (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

- Test Equipment Setup

 The measurement should be executed in a stable, windless and dark room between
 40min and 60min after lighting the back light at the given temperature for stabilization
 of the back light. This should be measured in the center of screen.

 Environment condition : Ta = 25 ± 2 °C

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Photo detector	Field
SR-3	1°
BM-7	2°

Photo detector

Field

SR-3 : 50㎝
BM-7 : 50㎝
EZ-Contrast : 0cm

TFT - LCD Module

LCD Panel

The center of the screen

- Definition of test point

320   960   1600

180   ⑨   ⑧   ⑦   Active Area

540   ⑥   ⑤   ④   ○ Test Point

900   ③   ②   ①
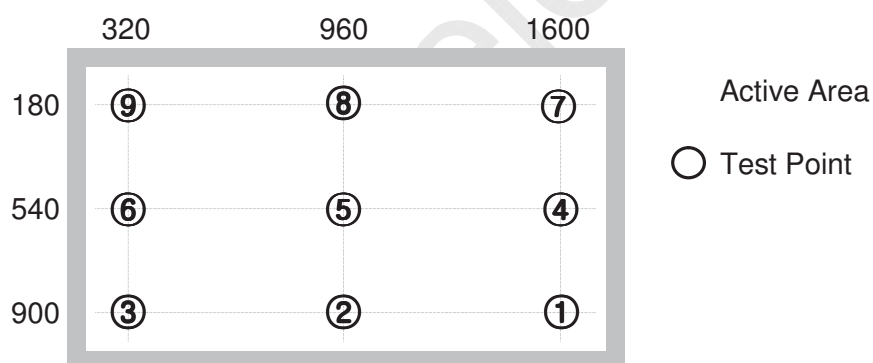
Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

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Note (2) Definition of 9 points brightness uniformity of White at Max dimming voltage

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

Display data

| Black (data off) | White (data on) | Black (data off) |

Optical Instruments Response

T_R　　　T_F

100%
90%

10%
0%

TIME
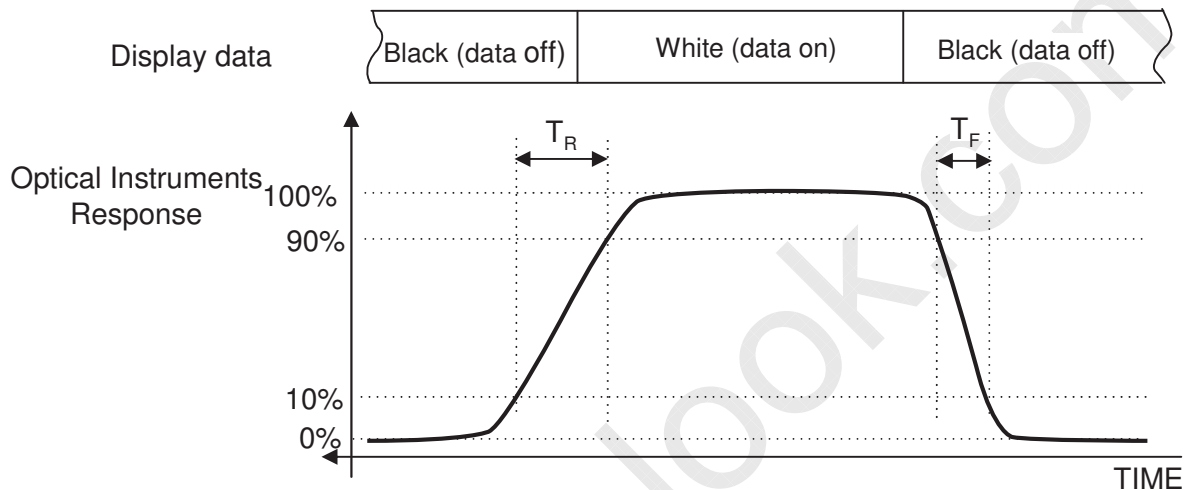
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)

Θ_U
Θ_R
Θ_L
Θ_D

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3. Electrical Characteristics

3.1 TFT LCD Module
The connector for display data & timing signal should be connected.

Ta = 25°C ± 2 °C

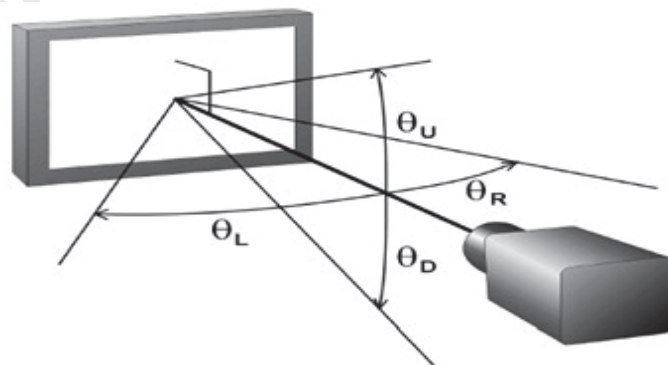| Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	600	-	mA	(2),(3)
	(b) White		-	1100	-	mA	
	(c) Sub Checker		-	1300	1500	mA	
Vsync Frequency		f_V	45	60	65	Hz	
Hsync Frequency		f_H	48	67.5	75	kHz	
Main Frequency		f_{DCLK}	65.0	74.25	80	MHz	
Rush Current		I_{RUSH}	-	-	4.5	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.
　　　(2) fv=60Hz, fDCLK = 74.25MHz, V_{DD} = 12.0V, DC Current.
　　　(3) Power dissipation check pattern (LCD Module only)
　　a) Black Pattern　　　b) White Pattern　　　c) N-Pattern
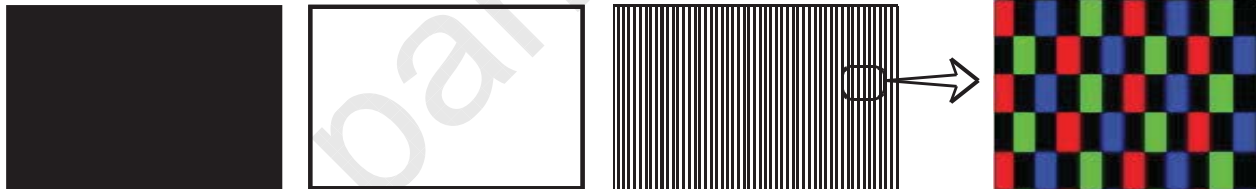
　　(4) Measurement Conditions

100%
90%

10%
GND

T_{RUSH}=470μs

V_{DD}
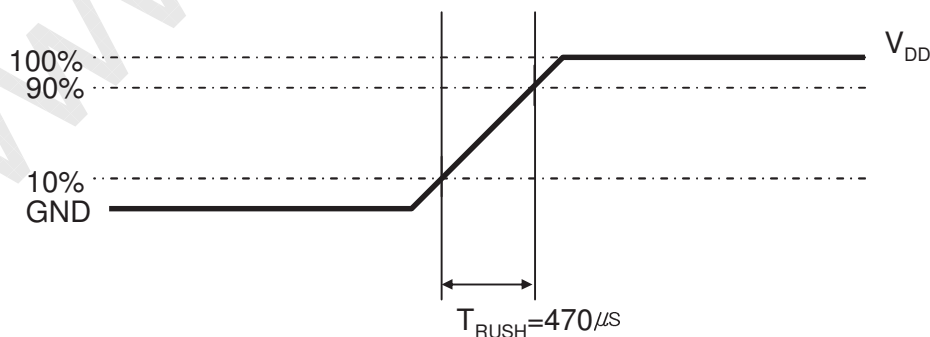
Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470μs.

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3.2 Back Light Unit

The back light unit contains 16 direct-lighting type CCFLs (Cold Cathode Fluorescent Lamp). The characteristics of lamps are shown in the following tables.

Ta=25 ± 2°C
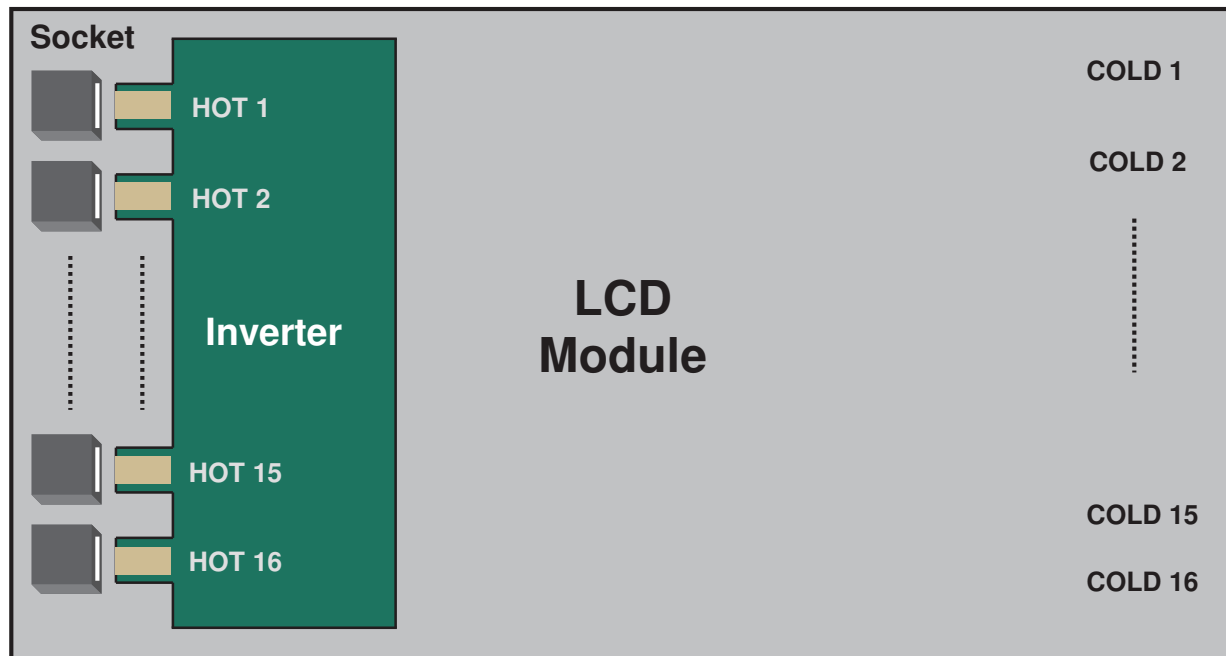
Item	Symbol	Min.	Typ.	Max.		Unit	Note
Lamp Voltage	V_L	-	1,140	-		Vrms	
Operating Life Time	Hr	50,000	-	-		Hour	(1)
Startup Voltage	Vs	-	-	0°C : 1,840		Vrms	
				25°C : 1,580			

Note (1) Life time (Hr) of a lamp : It is defined as the time in which it continues to operate under the condition of Ta = 25±2°C for a lamp until the brightness becomes 50% or lower than it's original value.

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3.3 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	22	24	26	V	Ta=25±2 °C
Input Current	I_{RUSH}	Vin=24.0V Vdim=3.3V Ta=25 °C	-	8.5	9.4	A	(1)
			-	7.5	8.25	A	(2)
Frequency	F_{LAMP}	Vin=24.0 V	31.0	32.5	34.0	kHz	-
Lamp Current	$I_{O,MAX}$	Vdim =3.3V	10.0	10.5	11.0	mArms	-
Backlight On/Off	ON	Vin=24.0 V	2.4	-	5.5	V	-
	OFF	Vin=24.0 V	0	-	0.8		
Dimming Control	V_{DIM}	Max Lum PWM = 100%	3.3	-	-	V	-
		Min. Lum PWM = 20%	-	0	-		

Note) Power Consumption is measured when 500 [cd/m^2] of luminance which is the typical luminance.
   Lamp Current is measured at the point before Lamp.

(1) Max Value of the Power Consumption is measured during initial turn-on time* of the backlight
(2) Max Value of the Power Consumption is measured after 60 min warm-up.

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4. Block Diagram
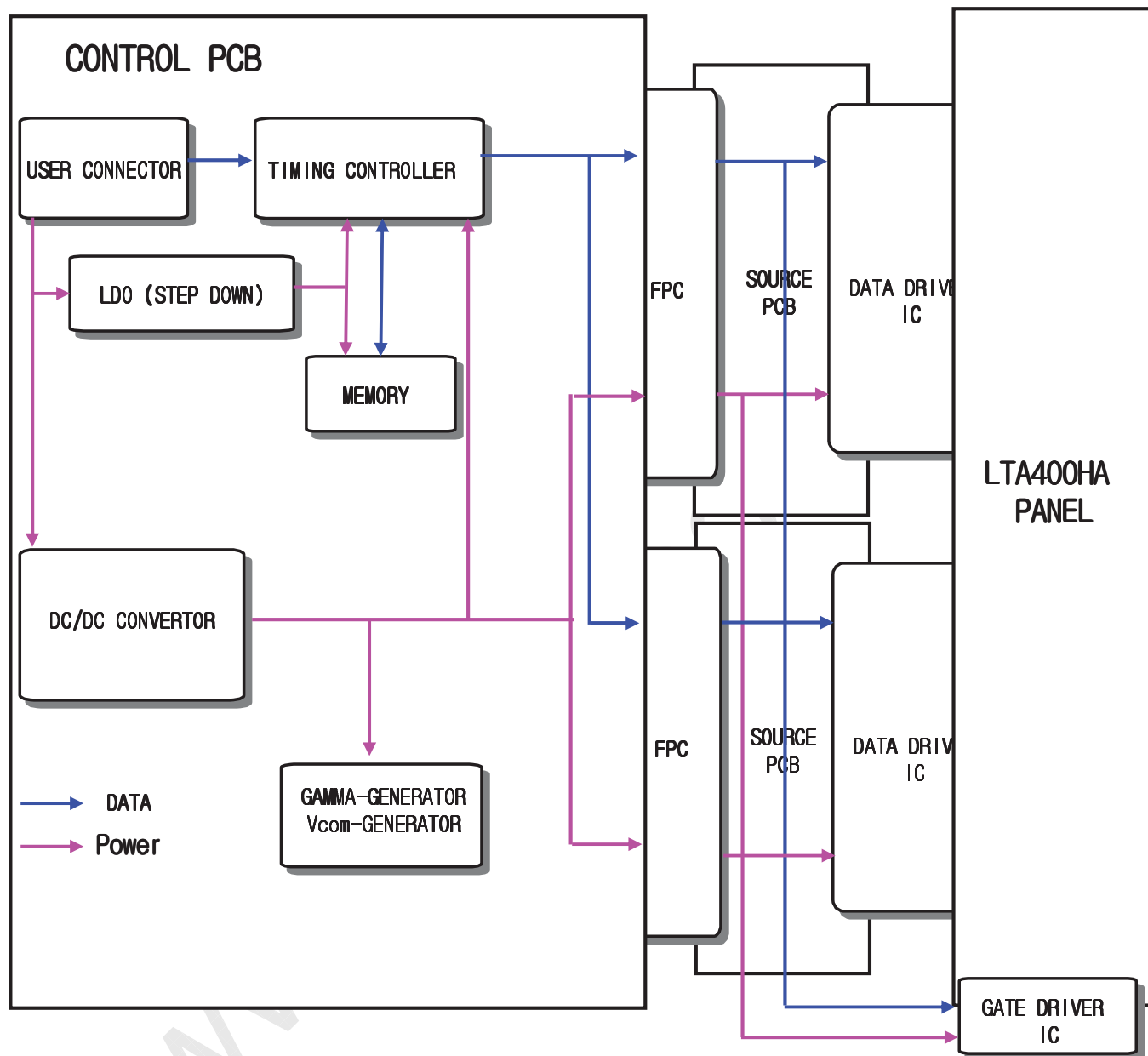
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5. Input Terminal Pin Assignment

5.1. Input Signal & Power   Connector : FI-RE51S-HF (JAE)

Pin	Description		Pin	Description	
1	Vdd (12V)		26		RE[0]P
2	Vdd (12V)		27		RE[1]N
3	Vdd (12V)		28		RE[1]P
4	Vdd (12V)		29		RE[2]N
5	Vdd (12V)		30		RE[2]P
6	No connection		31	Even LVDS Signal	GND
7	GND		32		RECLK-
8	GND		33		RECLK+
9	GND		34		GND
10	Odd LVDS Signal	RO[0]N	35		RE[3]N
11		RO[0]P	36		RE[3]P
12		RO[1]N	37		RE[4]N
13		RO[1]P	38		RE[4]P
14		RO[2]N	39	GND	
15		RO[2]P	40	No connection (NOTE1)	
16		GND	41	No connection	
17		ROCLK-	42	No connection	
18		ROCLK+	43	No connection	
19		GND	44	No connection	
20		RO[3]N	45	LVDS_OPTION (NOTE2)	
21		RO[3]P	46	No connection	
22		RO[4]N	47	No connection	
23		RO[4]P	48	No connection	
24	GND		49	No connection	
25	Even LVDS	RE[0]N	50	No connection	
			51	No connection	

(Note1) These PINS are only used for SAMSUNG internal using.
(Note2) LVDS OPTION : If this PIN : HIGH (3.3 V) → Normal LVDS format
                                : LOW (GND or N.C) → JEIDA LVDS format (Default)
          SEQUENCE   : On = VDD(T1) ≥ LVDS Option ≥ Interface Signal(T2)
                        OFF = Interface Signal(T3) ≥ LVDS Option ≥ VDD

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Note(3) Pin number starts from Right side

PCB

Pin No. 1   Pin No. 51

#1   #51

connect name

#1   #51
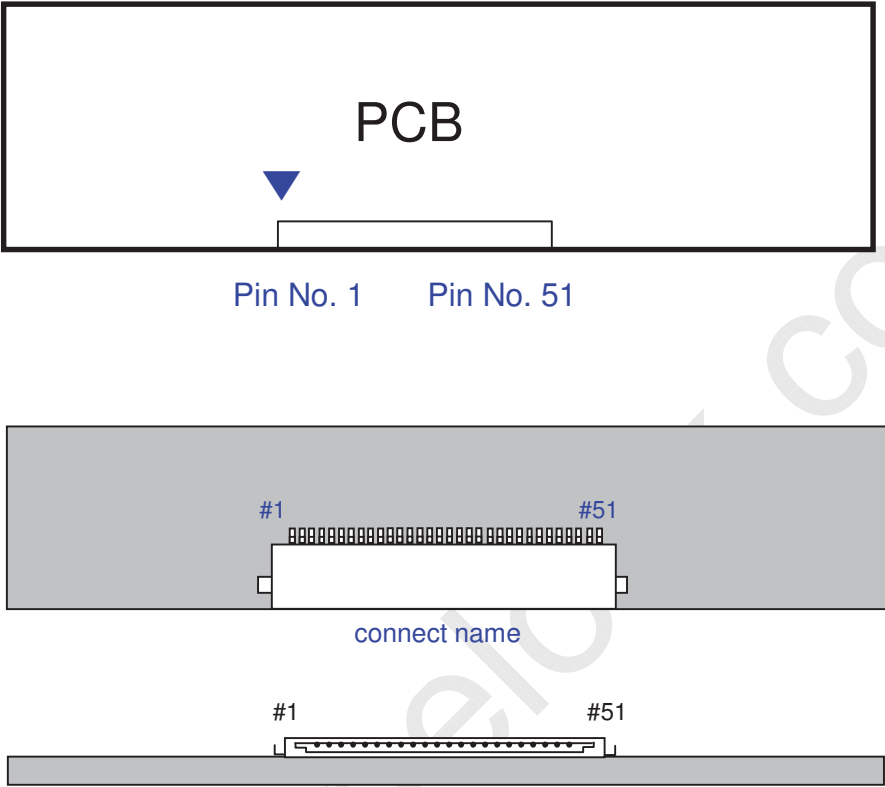
Fig. Connector diagram

a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pins should be separated from other signal or power.

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5.2. Inverter Input Pin Configuration

Connector :2002WR-14B1[Yeonho]

Pin No.	Pin Configuration (MASTER / SLAVE)
1	24 V
2	24 V
3	24 V
4	24 V
5	24 V
6	GND
7	GND
8	GND
9	GND
10	GND
11	Error Out [Normal :GND , Abnormal : Open Collector]
12	Backlight On /Off [ON:2.4 - 5.25 V, OFF: 0 - 0.8 V]
13	Dimming Control [0V:Min, 3.3V:Max]
14	No Connection

5.3. Inverter Input Power Sequence
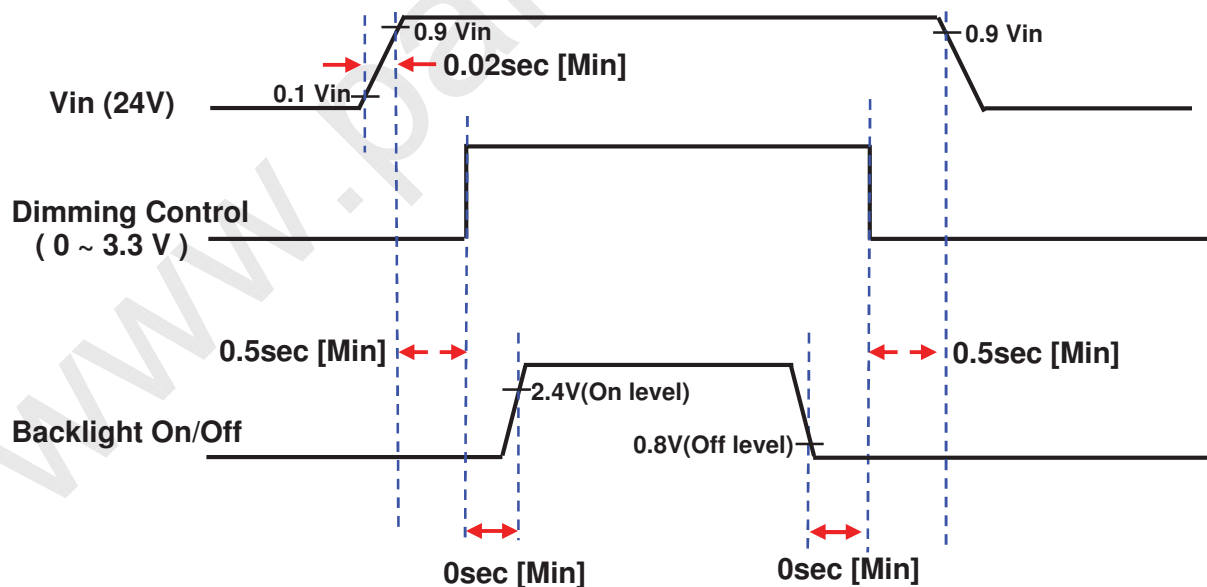
Note)   SEQUENCE :   On = Vin(24V) > Dimming Control≥ Backlight On/off

OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

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5.4 LVDS Interface
- LVDS Receiver : Tcon (merged)

	LVDS pin	JEIDA -DATA	VESA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4	R0
	TxIN/RxOUT1	R5	R1
	TxIN/RxOUT2	R6	R2
	TxIN/RxOUT3	R7	R3
	TxIN/RxOUT4	R8	R4
	TxIN/RxOUT6	R9	R5
	TxIN/RxOUT7	G4	G0
TxOUT/RxIN1	TxIN/RxOUT8	G5	G1
	TxIN/RxOUT9	G6	G2
	TxIN/RxOUT12	G7	G3
	TxIN/RxOUT13	G8	G4
	TxIN/RxOUT14	G9	G5
	TxIN/RxOUT15	B4	B0
	TxIN/RxOUT18	B5	B1
TxOUT/RxIN2	TxIN/RxOUT19	B6	B2
	TxIN/RxOUT20	B7	B3
	TxIN/RxOUT21	B8	B4
	TxIN/RxOUT22	B9	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DE
TxOUT/RxIN3	TxIN/RxOUT27	R2	R6
	TxIN/RxOUT5	R3	R7
	TxIN/RxOUT10	G2	G6
	TxIN/RxOUT11	G3	G7
	TxIN/RxOUT16	B2	B6
	TxIN/RxOUT17	B3	B7
	TxIN/RxOUT23	RESERVED	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0	R8
	TxIN/RxOUT29	R1	R9
	TxIN/RxOUT30	G0	G8
	TxIN/RxOUT31	G1	G9
	TxIN/RxOUT32	B0	B8
	TxIN/RxOUT33	B1	B9
	TxIN/RxOUT34	RESERVED	RESERVED

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5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	RED										GREEN										BLUE										GRAY SCALE LEVEL
		R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	G0	G1	G2	G3	G4	G5	G6	G7	G8	G9	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑ ↓ LIGHT	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1021
		0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1022
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1023
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑ ↓ LIGHT	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1021
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1022
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1023
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑ ↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	B1021
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B1022
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	B1023

Note) Definition of Gray :
　　　Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)
　　　Input Signal : 0 = Low level voltage, 1 = High level voltage

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6. Interface Timing

6.1 Timing Parameters (DE only mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock		$1/T_C$	65	74.25	80	MHz	-
Hsync	Frequency	F_H	48	67.5	75	KHz	-
Vsync		F_V	45	60	65	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	lines	-
	Vertical Total	T_{VB}	1092	1125	1380	lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does
   not have an effect on normal operation.
 (1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
 (2) Internal VDD = 3.3V

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6.2 Timing diagrams of interface signal (DE only mode)

DE

DCLK

DATA
SIGNALS

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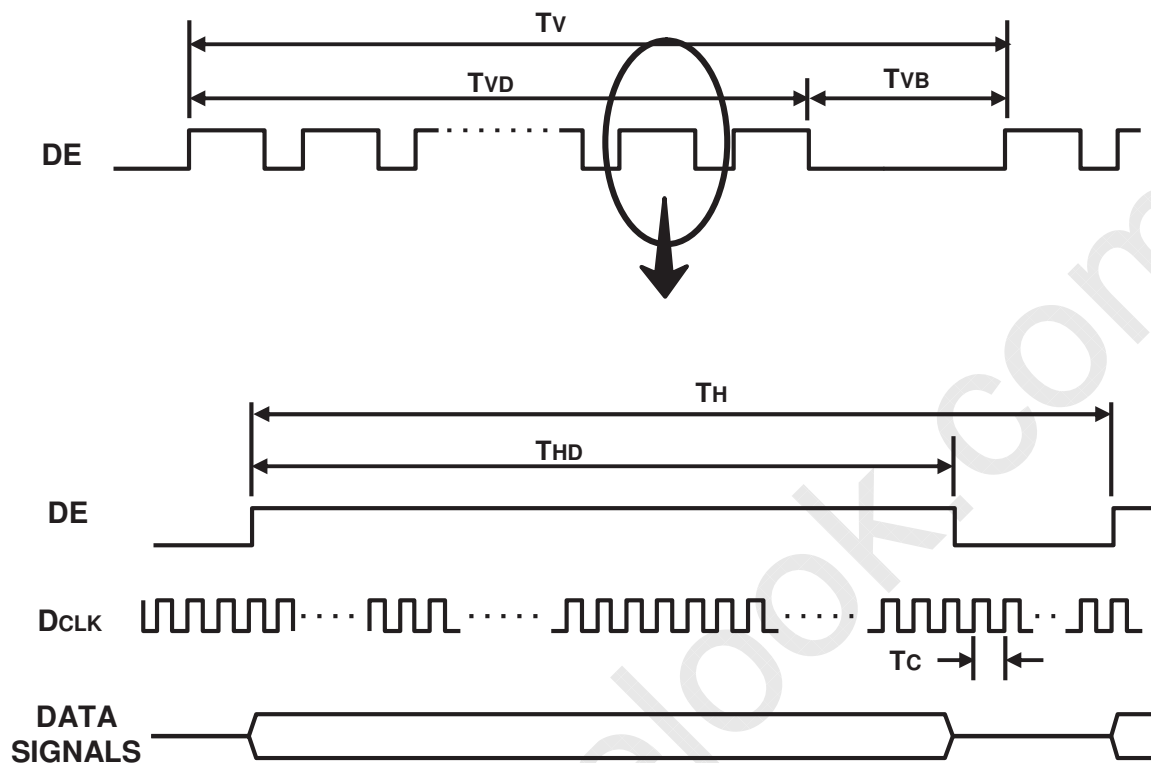
6.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.
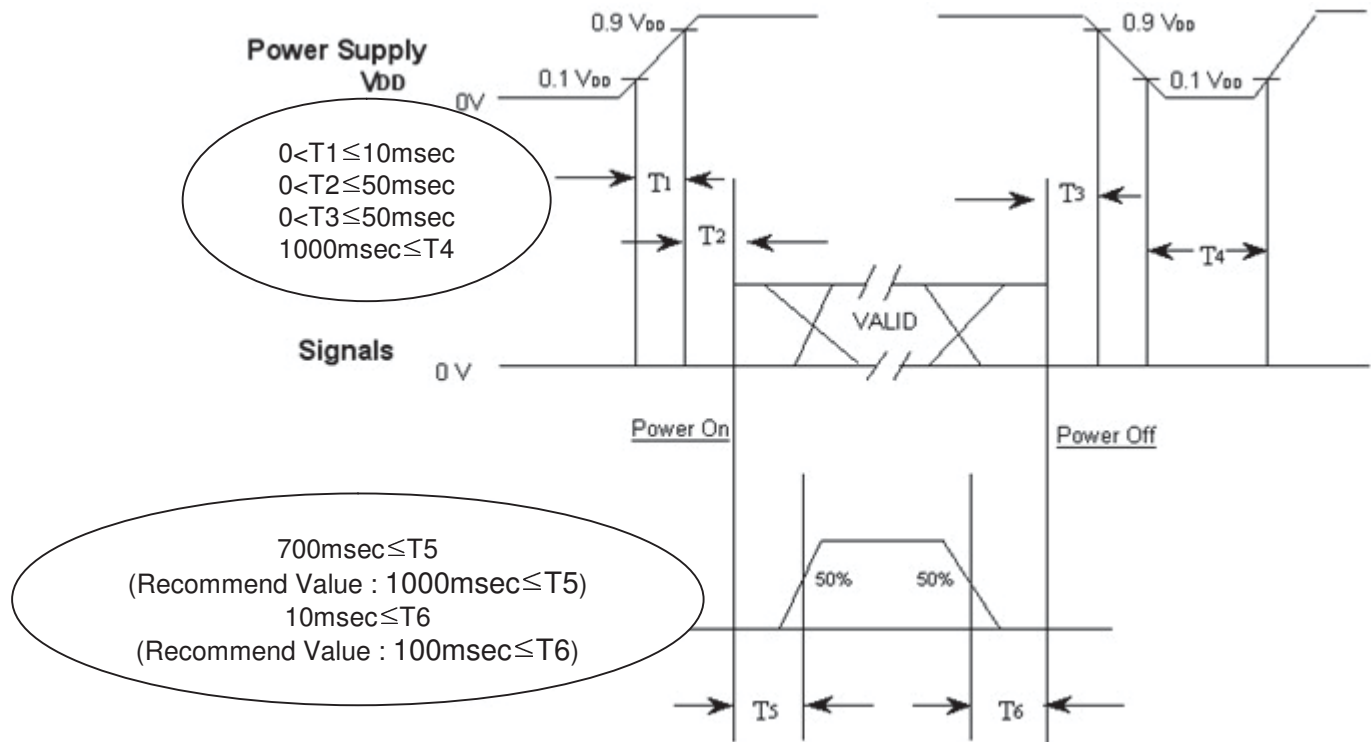
T1 : V_{DD} rising time from 10% to 90%
T2 : The time from V_{DD} to valid data at power ON.
T3 : The time from valid data off to V_{DD} off at power Off.
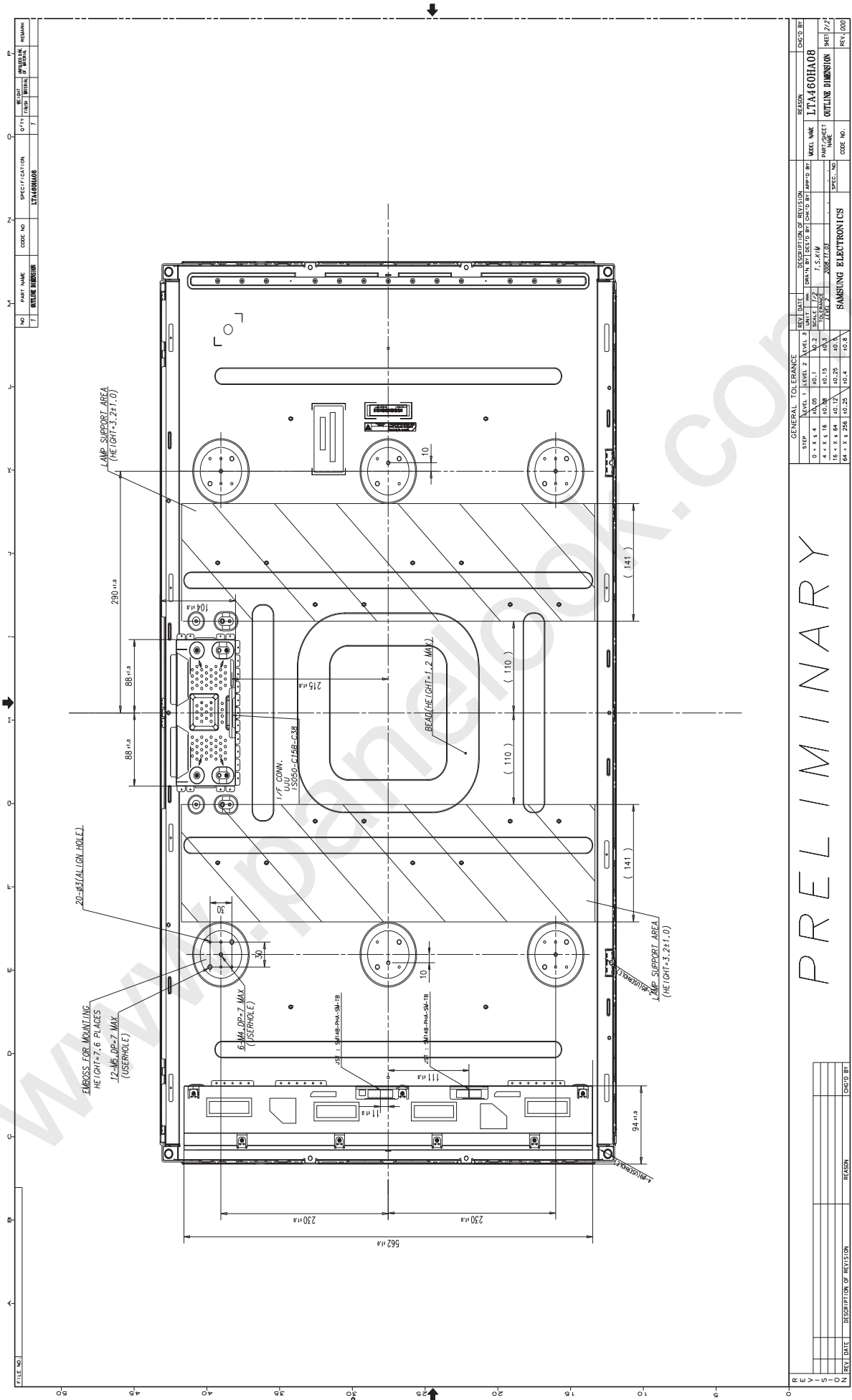T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.
- In case T5 is less than 1000msec and T6 is less than 100msec, Garbage Display can be seen.(It is not related to electrical function issue, Just for recommendation to prevent Garbage Display)

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* NOTES

1. BACKLIGHT : 16 COLD CATHODE FLUORESCENT LAMPS.
2. I/F CONNECTOR SPECIFICATION.(51PIN)
   - 51PIN
   MAKER : JUGI, (I2060-C51P8-C38
   PART NAME : I2060-C51P8-C38
   CODE NO. : 3771-008515
3. INVERTER CONNECTOR SPECIFICATION.
   (1) POWER CONN.
   - MAKER : JST
   - PART NO. : SM40-PH4-SM-TB
4. USER HOLE: ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 7.0mm MAX.
5. GAP BETWEEN TOP CHASSIS AND GLASS IS 1.4mm (+0.5/-0.5).
6. WEIGHT : MAX 15,500g
7. BLACK MATRIX SPEC.
   - |A - B| ≤ 2.0 mm
   - |C - D| ≤ 2.0 mm

PRELIMINARY

SAMSUNG ELECTRONICS

MODEL NAME: LTA460HA08

OUTLINE DIMENSION

GENERAL TOLERANCE				
STEP	LEVEL 1	LEVEL 2	LEVEL 3	
0 < X ≤ 4	±0.05	±0.1	±0.2	
4 < X ≤ 16	±0.08	±0.15	±0.3	
16 < X ≤ 64	±0.1	±0.25	±0.5	
64 < X ≤ 256	±0.17	±0.4	±0.8	

SHEET 1/2

REV. 000

PRELIMINARY

LAMP SUPPORT AREA
(HEIGHT=3.2±1.0)

BEAD(HEIGHT=1.2 MAX)

I/F CONN.
UJU :S05D-C15B-C38

20-Ø3(ALIGN HOLE)

EMBOSS FOR MOUNTING
HEIGHT=7.6 PLACES

12-M5,DP=7 MAX
(USERHOLE)

6-M4,DP=7 MAX
(USERHOLE)

JS1 : SM4B-PH4-SM-TB

JS1 : SM4B-PH4-SM-TB

LAMP SUPPORT AREA
(HEIGHT=3.2±1.0)

	GENERAL TOLERANCE		
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < x ≤ 4	±0.05	±0.1	±0.2
4 < x ≤ 16	±0.08	±0.15	±0.3
16 < x ≤ 64	±0.12	±0.25	±0.4
64 < x ≤ 256	±0.25	±0.4	±0.8

SAMSUNG ELECTRONICS

MODEL NAME: LTA460HA08

PART/SHEET NAME: OUTLINE DIMENSION

8. Reliability Test

Item	Test condition	Quantity
Temperature Step Stress	-20 ～ 60℃, 10Cycle determination	4EA
HTOL	50℃, 500hr determination	4EA
LTOL	0℃, 500hr determination	4EA
HTS	70℃, 500hr determination	4EA
LTS	-30℃, 500hr determination	4EA
THB	40℃ / 95%RH, 500hr determination	4EA
WHTS	60℃ / 75%RH, 500hr determination	4EA
Thermal Shock	-20 ℃ ~ 60 ℃, 200cycle determination	4EA
ESD (non-operation)	C D M ：±10 kV,150pF/330 Ω,9Point,3times/Point	3EA
ESD(operation)	contact ：±8 kV ,150pF/330Ω,200Point,1 time/Point non-contact：±15 kV,150pF/330Ω,200Point,1 time/Point	3EA
Input Con. ESD	contact：±2kV,150pF/330,Input Con.Pin,3 times/Pin	3EA
POWER ON/OFF	30sec (on) / 30sec(off) : 12,000 times	4EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	Half Sine, 40G, 11msec, ±X,Y,Z 1time/axis Half Sine, 30G, 11msec, ±Z 1time/axis	3EA
PALLET Vibration	1.05Grms 5~200Hz 1hr	1PALLET(10EA)
PALLET Drop	4 edge 1face(bottom) 20 cm	1PALLET(10EA)

[Result Evaluation Criteria]
Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.


```
*    HTOL/ LTOL  : High/Low  Temperature Operating Life
**   THB         : Temperature Humidity Bias
*** HTS/LTS      : High/Low Temperature Storage
**** WHTS        : Wet High Temperature Storage
```

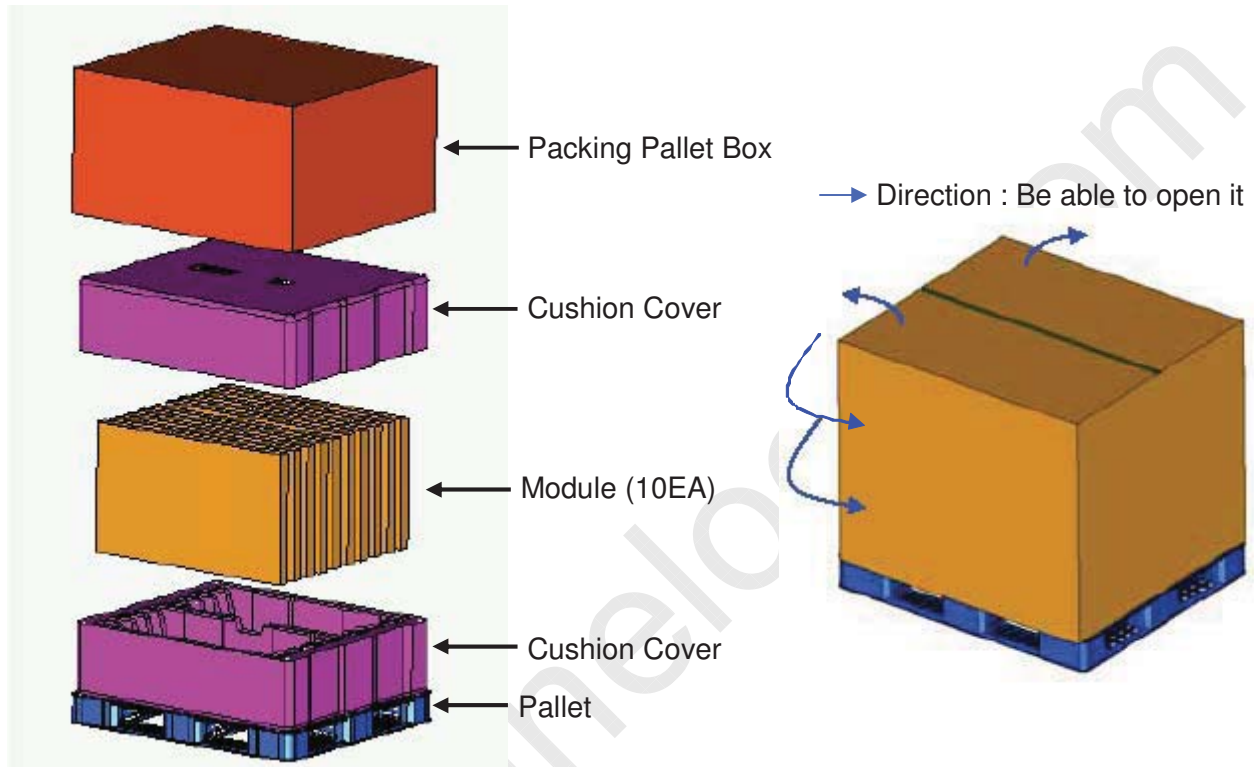| MODEL	LTA460HA08	Doc. No	06-002-S-081127	Page	23 / 28

9. PACKING

9.1 CARTON (Internal Package)
(1) Packing Form
　　Corrugated fiberboard box and corrugated cardboard as shock absorber
(2) Packing Method

Packing Pallet Box

Direction : Be able to open it

Cushion Cover

Module (10EA)

Cushion Cover

Pallet

9.2 Packing Specification

Item	Specification	Remark
LCD Packing	10ea / (Packing-Pallet Box)	1. 160Kg / LCD (10ea) 2. 10 Kg / Cushion-pallet (2ea) 3. 8 Kg / Packing-Pallet Box (1ea) 4. Cushion-pallet Material : EPS 5. Packing-Pallet Box Material : DW4
Pallet	1Box / Pallet	1. Pallet weight = 8.8kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1270mm(H) x 1150mm(V) x 844mm(height)
Total Pallet Weight	188kg	Pallet(10kg) + Module(16x10=160) + Cushion(up+bottom=10kg) + Pallet-BOX(8kg)

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10. MARKING & OTHERS

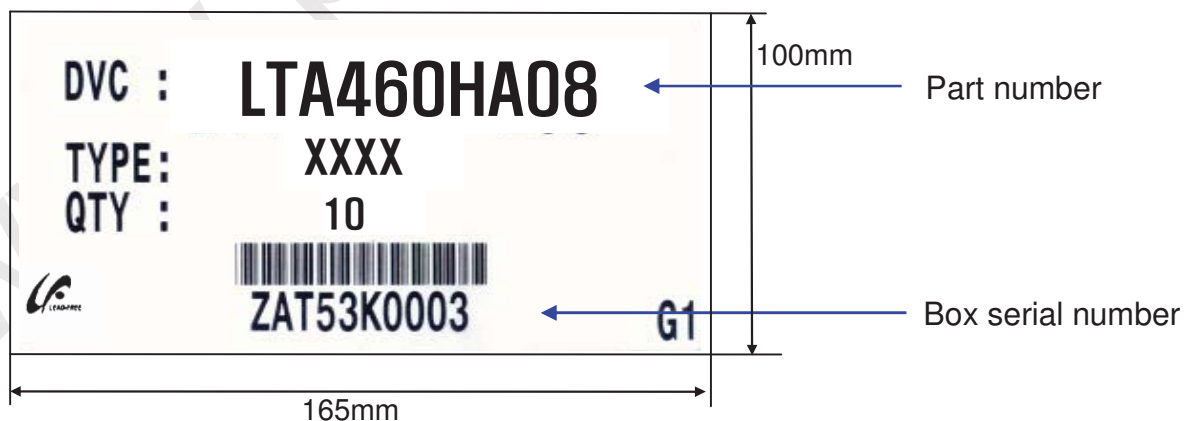A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTA460HA08
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X

- Cell Position No. (In the Glass)
- Glass No. (In the one Lot)
- Lot No. (Glass)
- Month
- Year (Note1)
- Product code
- Line

(4) Nameplate Indication

Week code : 05 29
- week
- year

Revision code

Lot number

LTA460HA08
0529
XXXXXXXXXX   XXX
MADE IN CHINA
40mm
80mm

(5) Packing box attach

DVC : LTA460HA08
TYPE: XXXX
QTY :   10
ZAT53K0003   G1
100mm
165mm

Part number

Box serial number
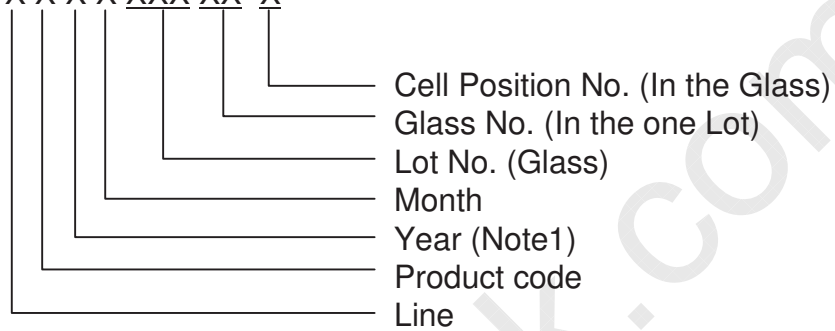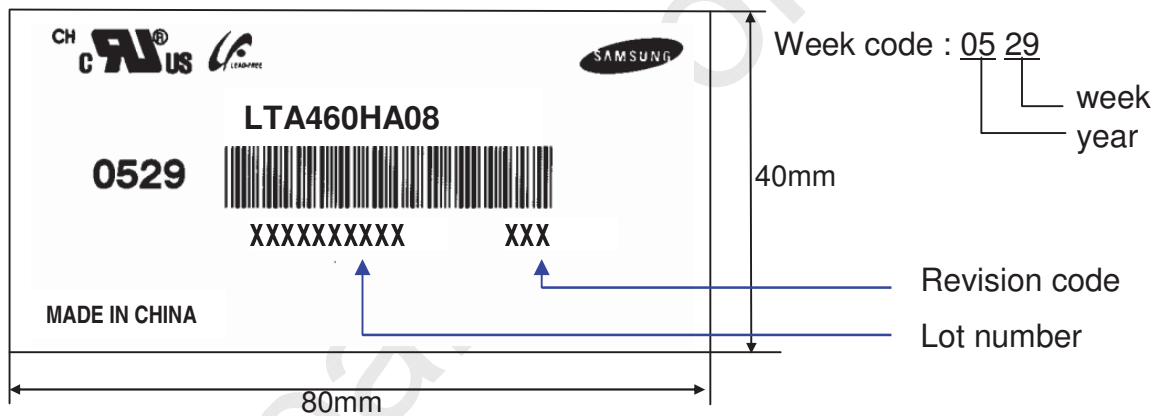
(6) Others
1. After service part
Lamps cannot be replaced because of the narrow bezel structure.

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11. General Precautions

11.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and CCFT back light.

(d) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(i) Protect the Module from static, or the CMOS Gate Array IC would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not pull or fold the lamp wire.

(m) Do not adjust the variable resistor located on the Module.

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized.

(o) Pins of I/F connector should not be touched directly with bare hands.

11.2 Storage

(a) Do not leave the Module in high temperature, and high humidity for a long time.
It is highly recommended to store the Module with temperature from 0 to 35℃
and relative humidity of less than 70%.

(b) Do not store the TFT-LCD Module in direct sunlight.

(c) The Module should be stored in a dark place. It is prohibited to apply sunlight or
fluorescent light in storing.

11.3 Operation

(a) No Connection or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic
interference should be done by system manufacturers. Grounding and shielding methods
may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should
be connected directly with a minimized length. A longer cable between
the back light and the inverter may cause lower luminance of lamp(CCFT) and
may require higher startup voltage(Vs).

11.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20±15℃
- Humidity : 55±20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature,
humidity, display patterns or operation time etc.., It is strongly recommended
to contact SEC for Application engineering advice. Otherwise, its reliability and
function may not be guaranteed. Extreme conditions are commonly found at
Airports, Transit Stations, Banks, Stock market, and Controlling systems.

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11.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.

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